



INDIANA
DEPARTMENT *of*
EDUCATION

2023 INDIANA ACADEMIC STANDARDS **INTEGRATED STEM**

HIGH SCHOOL



Indiana Academic Standards Context and Purpose

Introduction

The Indiana Academic Standards for High School Integrated STEM are the result of a process designed to identify, evaluate, synthesize, and create high-quality, rigorous learning expectations for Indiana students.

The Indiana Academic Standards are designed to ensure that all Indiana students, upon graduation, are prepared with essential knowledge and skills needed to access employment, enrollment, or enlistment leading to service.

What are the Indiana Academic Standards and how should they be used?

The Indiana Academic Standards are statements designed to help educators, parents, students, and community members understand the necessary content for each grade level, and within each content area domain, to access employment, enrollment, or enlistment leading to service. These standards should form the basis for strong core instruction for all students at each grade level and for each content area. The standards identify the minimum academic content or skills that Indiana students need in order to be prepared for success after graduation, but they are not an exhaustive list.

While the Indiana Academic Standards establish key expectations for knowledge and skills and should be used as the basis for curriculum, the standards by themselves do not constitute a curriculum. It is the responsibility of the local school corporation to select and formally adopt curricular tools, including textbooks and any other supplementary materials, that align with Indiana Academic Standards. Additionally, corporation and school leaders should consider the appropriate instructional sequence of the standards, as well as the length of time needed to teach each standard. Every standard has a unique place in the continuum of learning, but each standard will not require the same amount of time and attention. A deep understanding of the vertical articulation of the standards will enable educators to make the best instructional decisions. The Indiana Academic Standards must also be complemented by robust, evidence-based instructional practices to support overall student development.

What are Integrated STEM Standards?

Integrated STEM education is the purposeful integration of science, technology, engineering, and mathematics through an engaging and motivating, student-centered pedagogy and curriculum. Students are engaged in solving real-world problems using inquiry-based learning, problem-based learning, and engineering design practices, which require critical thinking and collaboration.

Indiana's Integrated STEM Standards are intended to be embedded within instruction across content areas and courses. Implementation of Integrated STEM Standards ensures that all

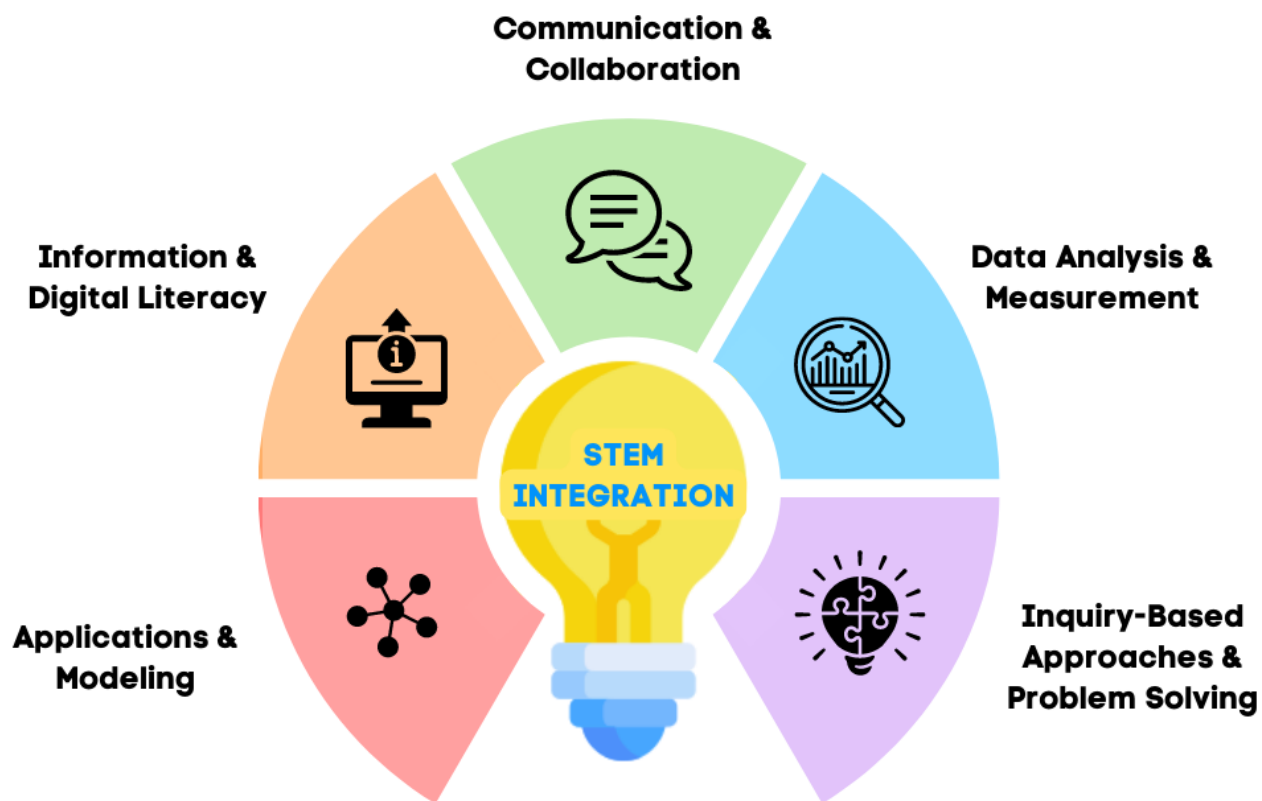
students are building skills in each of the domains throughout the school year, and should be an intentional component of instructional planning for all teachers. The standards may also be leveraged to identify appropriate work products or assessment measures to gauge student learning such as group presentations to school or community stakeholders (Communication and Collaboration), asking a question and developing a plan to move toward a solution (Inquiry-Based Approaches and Problem Solving), and developing multiple representations of data (Applications and Modeling).

The standards are intended to inform the development of a comprehensive STEM learning continuum across students' K-12 experience. Through engaging in real-world problem-solving and critical thinking, as well as a culture of collaboration and creativity, students will be prepared for life and career.

Indiana's Integrated STEM Standards outline what students should know and be able to do across the following five domains:

- **Communication and Collaboration** - Students work cooperatively to plan investigations, analyze information, and share results or conclusions using various forms of communication (e.g., writing, speaking, listening, digital).
- **Data Analysis and Measurement** - Students collect, process, and interpret qualitative and quantitative data to identify patterns, relationships, and insights. Students use mathematical and/or computational methods to analyze data sets and draw conclusions about phenomena or investigations.
- **Inquiry-Based Approaches and Problem Solving** - Students think critically and collaborate to explore real-world problems by asking questions, gathering information, and analyzing data to develop creative solutions that are evidence-based and relevant for the context or situation.
- **Applications and Modeling** - Students use computational, graphical, virtual, mathematical, and/or physical methods to create a representation of a real-world situation in order to describe systems, show relationships, represent data, and test solutions.
- **Information and Digital Literacy** - Students identify information needs, locate relevant information, and evaluate the quality of the source. Students use evaluation strategies to determine the best digital tool(s) for the creation and management of information.

The image below illustrates the interconnected nature of the domains and the notion that integrated STEM is a multi-dimensional experience for students. The domains do not prescribe a specific order in which they must be introduced, but rather work in concert to foster the integration and application of disciplinary content.



Acknowledgments

The Indiana Department of Education appreciates the time, dedication, and expertise offered by Indiana's K-12 educators, higher education professors, representatives from business and industry, families, and other stakeholders who contributed to the development of the Indiana Academic Standards. We wish to specially acknowledge the committee members, as well as participants in the public comment period, who dedicated many hours to the review and evaluation of these standards designed to prepare Indiana students for success after graduation.

High School Integrated STEM

Communication and Collaboration	
HS.CC.1	Communicate evidence, investigations, analyses, and the solution(s) of a problem in multiple media forms appropriate for the audience.
HS.CC.2	Implement roles and responsibilities to collaborate, contribute, and/or lead within and across various group settings (i.e., online, onsite and/or hybrid) and situations.
HS.CC.3	Evaluate competing solutions or arguments in a systematic way based on qualitative and/or quantitative evidence.
Data Analysis and Measurement	
HS.DM.1	Use multiple systems of measurement (i.e., standard and metric) and data sets (e.g., plots, tables, graphs, charts) defined in course-level content standards to analyze real-world scenarios and the mathematical relationships represented by the data.
HS.DM.2	Construct visual representations or conduct statistical analyses defined in course-level content standards.
HS.DM.3	Use approximations and evaluate reasonableness of observations, results, and solutions throughout processes.
Inquiry-Based Approaches and Problem Solving	
HS.IPS.1	Conduct or extend an investigation, analyze results, iterate, and revise to improve the design.
HS.IPS.2	Determine one or more viable solutions using data and information to resolve a scenario given criteria and constraints.
HS.IPS.3	Integrate processes and methodologies across disciplines to incorporate multiple sources of evidence, including data generated by the student, to support defining a solution.
HS.IPS.4	Evaluate data analysis to determine alignment to the construct, validity and/or reliability concerns.
HS.IPS.5	Design and conduct surveys or experiments minimizing bias and defining limitations of the data set used for analysis (e.g., measurement error, sample selection).
Applications and Modeling	
HS.AM.1	Interpret and evaluate relationships among data sets.
HS.AM.2	Create advanced models (e.g., mathematical models, computer simulations) to represent and explain natural and designed systems, defined in course-level content standards.
HS.AM.3	Use evidence-based models to describe relationships between systems or between components of a single system.
HS.AM.4	Demonstrate the use of computational, graphical, virtual, mathematical, and/or physical modeling to identify conflicting considerations before the entire system or solution is developed.

Information and Digital Literacy	
HS.IDL.1	Analyze tradeoffs of using a variety of tools to solve a given problem including technology.
HS.IDL.2	Review and compile information from multiple sources, including sources generated by the student, to solve a problem.
HS.IDL.3	Evaluate the potential impact (short and/or long-term) of different technology solutions on society and the environment.